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OFFICIAL JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA BULLETIN

JUNE, 1952 · NUMBER 30

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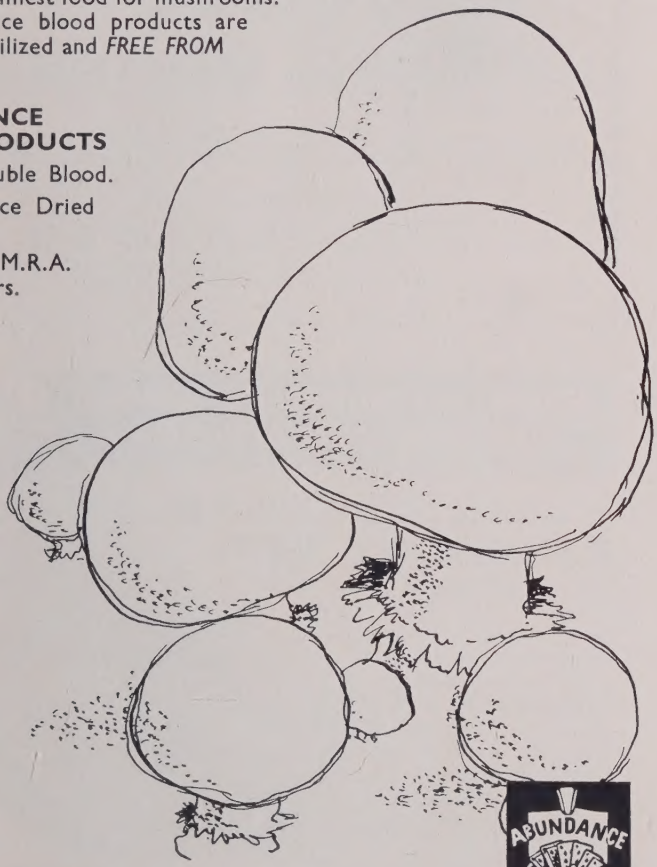

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The NEW
MGA BULLETIN

JUNE 1952
NUMBER 30

EDITORIAL:

POISON

Gentle reader, are you suffering from—

(*a*) tightness of the chest,
(*b*) noticeable increase in excitability,
(*c*) increased flow of saliva and tears,
(*d*) contraction of eye pupils,
and/or (*e*) tremors ?

If you are, you should at once seek out the cause. If you find it is only Mr. Middlebrook " refreshing " you with a lecture on Short Composting, all may be well. But, beware ; these are also the symptoms of poisoning by organo-phosphorus compounds such as Parathion and HETP (or TEPP).

The Agriculture (Poisonous Substances) Bill is designed to protect those who use these and other dangerous chemicals on farms and nurseries. As it will not be possible for regulations to be in force for some months, a Voluntary Precautions Scheme is advocated for 1952.

The general recommendations refer to the protective clothing to be worn, responsibility for the provision and maintenance of this clothing, washing facilities, personal cleanliness, the cleanliness of equipment, maximum working periods, supervision of the job, the keeping of records, reporting and treatment. Copies of the scheme are available from Mr. Secretary Watson.

Medical facilities for the early detection of absorption of the various poisonous substances are shortly to be made available to employers and doctors.

In the meantime, Vitax Ltd. recommend that if HETP is swallowed accidentally, one should induce vomiting at once by the adminstration of an emetic such as warm salt water, mustard water, soapy water or tartar emetic—or by applying the finger at the back of the throat. Then give plenty of milk or water. Make the patient lie down and keep warm. Should HETP come into contact with the eyes, swill them freely with clean water for at least 10 minutes.

It all sounds very frightening. But we must not forget that, provided the precautions advised by the suppliers are taken, and provided these poisons are handled only by intelligent, responsible workers, there is no cause for alarm among mushroom growers.

HETP and TEPP are less dangerous than Nicotine, and are harmless within a few hours of application, so mushrooms can safely be eaten 24 hours after the beds have been treated with HETP or TEPP. We know a good deal less about Parathion, however, and it ought not at this stage to be used within three weeks of the onset of cropping. A Government " working party " is inquiring into this particular question.

F.C.A.

Stanley Middlebrook's Diary

April 8th. No-one can say we are without the courage of our convictions at Brayton. In face of the universal—dare I say, blind—acceptance of trays we are equipping a new house with *shelves*. The decision wasn't difficult.

April 16th. We are always told it is preferable to use unsterilized soil unless there is known disease contamination. A large scale test (1,200 sq. ft. on each side of a house) has shown sterilized soil 36% better than unsterilized. Neither side had any sign of disease.

April 24th. During my long talk on Short Composting at the M.R.A. Refresher Course this morning I showed a diagram of one of my triangular stacks in section. A comment during lunch : " Middlebrook does make hard going of it ; how does he manage with hundreds of pyramids all over the place ? "

April 25th. During Mr. Boxall's talk yesterday, he illustrated the old hand-composting methods by showing it being turned by a bearded old man. If this hirsute connection is taken to its limit, I suppose every time I look at trays I should have a shave.

April 29th. Apologies for error in my March 10th entry. The phrase starting at the end of line 6 should read :—" a 2 lb. crop isn't good enough on *shelves*." It was something of an achievement to get that one past the Editor !

May 1st. To argue with John Atkins is to court disaster, so I won't argue. But I think some of the figures in his article on " The Cost of Composting " (Bulletin 29) are quite inaccurate. His labour cost proportions of £2,100—£870—£330 *must* be wrong. An ordinary composter does not cut out much labour ; compost has still to be manhandled. Only a machine handling the whole process shows any considerable saving. Again, I cannot accept a 50% reduction in bill for manure when short composting. From experience I can say that the figure is more like 15% - 20%, as so much happens so quickly in short composting that the loss of material is surprisingly near to the loss by standard methods.

May 4th. In Darlington's latest " Mushroom News," last par. p.159, I read :—" Research being uppermost in everyone's mind. . . ." Is it ? There is no universal rush to keep research going. Do more than the faithful few (comparatively speaking) care a hang for research ? To many it is just part of the Welfare State, something for nothing. Yet the grower's money is still needed to keep the work going and those who are willing to let others do the paying are frankly not playing the game. No, Mr. Editor of " Mushroom News," one would have to search and re-search for Research in the minds of many growers.

May 7th. As the Editor of this bulletin—having searched and re-searched for an inkling of sense in these notes of mine—has found it difficult to allow me even one page this month, I have expressed my views on his parsimony and have assured him that he may expect nothing next month. (I leave the remaining space for the Editorial " Come-back.") *As usual, Stanley, you don't !—Editor.*

WHO'S WHO
3—H. H. GLASSCOCK

Up to 1939, Wye was the magnet for a multitude of mushroom inquiries. Of the many scientists associated with and experimenting on mushrooms, spawn, diseases and pests during that fruitful period, only Mr. H. H. Glasscock remains. He entered the Mycology Department of the College in 1933 to take part in an investigation on a plant disease, but his first close contact with mushrooms and mushroom growers was not until 1936, when the work of development and preparation there of pure-culture spawn was placed in his charge.

Not long before this the preparation of pure culture spawn had been mainly in the hands of U.S.A. and France and certain details of the process were veiled in secrecy. Dr. Ware had therefore started an enquiry into methods and with the help of Dr. Pizer a practical process was evolved (1). Problems met in the preparation of spawn soon stimulated an interest in other aspects of the industry and numerous minor investigations were started.

At the end of 1937, Dr. Ware succeeded Professor E. S. Salmon as Advisory Mycologist (Plant Pathologist) and Mr. Glasscock was appointed his assistant. The Advisory Mycologist was expected to give advice to farmers in his area on crop diseases and to investigate local problems when time permitted. Enquiries sometimes came from mushroom growers and there was always a long list of unanswered questions. Two of these, which claimed Mr. Glasscock's special attention, were Truffle (2) and the effect of wood preservatives on mushroom growth (3).

Everyone of us regrets that, early in the War, investigations at Wye on mushroom problems ceased and were never resumed.

In 1946, on the formation of the N.A.A.S., Dr. Ware retired and Mr. Glasscock was appointed to take up his duties. There can be very few growers of more than a couple of years' commercial experience who have not at one time or another received helpful identifications, diagnoses or advice from him, indirectly if not directly.

I have on a number of occasions had the honour of lecturing with him at courses and conferences, and I know he does not court the limelight. But he is ever ready to help where he can, in whatever

capacity. In particular I might mention his work on the Mushroom Film Strip, his revision of Bulletin 34, his contributions to Brains Trusts, his membership of the M.G.A. since its inception and his seat on the M.R.A. Directorate, representing the Ministry of Agriculture in our deliberations.

F.C.A.

1. WARE, W. M. and GLASSCOCK, H. H. (1946). Pure Culture Mushroom Spawn. Agriculture, **53**, 353—63.
2. GLASSCOCK, H. H. and WARE, W. M. (1941). Investigations on the Invasion of Mushroom Beds by *Pseudobalsamia microspora*. Ann. Appl. Biol., **28**, 85—90.
3. PIZER, N. H. and GLASSCOCK, H. H. (1943). Experiments to determine the effect of certain wood preservatives on the growth and cropping of the cultivated mushroom (*Psalliota campestris*). Ann. Appl. Biol., **34**, 34—44.

DR. AND MRS. BELS MOVE TO CANADA

The Dutch Government, like others in Europe, has recently found the cost of rearmament a heavy burden and has sought to reduce its expenditure in various ways. The economy axe has fallen on, among other things, mushroom research. Mushrooms form a very small part of Holland's enormous horticultural industry, and the Dutch Government decided that the staff employed on mushroom research must give part of their time to other crops.

Rather than do this, Dr. and Mrs. Bels sought another opening where they could continue their work on mushrooms. They have arranged to start a laboratory for Messrs. Slack Bros. Mushroom Department, Waterloo, Quebec, Canada, and left Holland for Canada in May. They carry with them best wishes from their many friends in Europe.

In a letter to the Editor they say : " We are very sorry to have to leave the Dutch mushroom growers, but they will not be completely deprived of advice. Mushroom growing in Holland has developed mainly in the direction of air-conditioned houses, and the experts in this field remain, viz., Mr. Spoelstra and Mr. J. A. Veerman, of the Institute for Horticultural Engineering. Our assistant is going there to grow mushrooms in the new experimental house which has been built in the Institute's grounds to try out various systems of air circulation and different insulating materials."

SEEN THIS ?

"Asbestolux " is a new incombustible building board with twice the thermal insulation value and half the weight of any comparable board. It is claimed to be ideal as a steam-proof lining for mushroom houses. Its properties are stated to be : Absolutely fireproof ; does not crack or shatter when exposed to naked flame ; light and strong ; high thermal insulation value ; completely stable ; will not warp, twist or wave ; unaffected by heavy steam, immersion in water, or extreme temperature change ; proof against rot and termite ; excellent resistance to acids ; easily worked with ordinary joiners' tools ; no special decorative treatment necessary. Manufactured by The Cape Asbestos Co. Ltd., 114-116 Park Street, London, W.1.

THE CULTIVATED MUSHROOM-3

MORPHOLOGY *(continued)*

By ANDRÉ SARAZIN

Kligman (1942) draws attention to the presence, in old cultures, of chains of large short swollen cells, which resemble chlamydospores and which he interprets as secondary spores of the cultivated mushroom. This author was able to bring about their germination into a normal mycelium which subsequently produced carpophores and a detailed account of this has been given by him. These structures have been found in the depths of the bed by me and it is my opinion that they have a survival value for the species when conditions become unfavourable for the existence of the mycelium. A complete study of these chlamydospores in the depths of the bed is being undertaken.

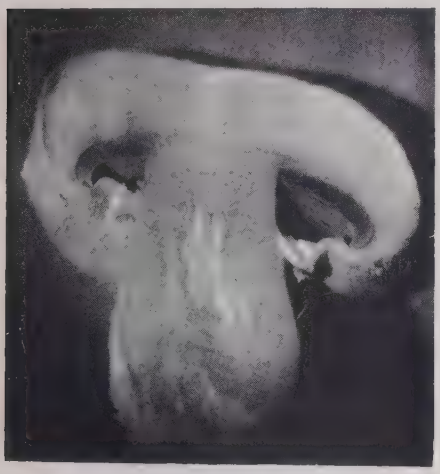


Fig. 6. Section through a carpophore displaying the hymenial gills.

Fruit bodies or Carpophores. It is unnecessary to give a detailed account of the shape of the carpophore or what is popularly termed the mushroom—so familiar is it to mushroom growers. In plain language it consists of two parts, the stalk and the cap which gives shelter on its lower surface to the spore-bearing tissue or *hymenium*.

Between the stalk and the cap, in young forms, a relatively thick veil joins the margin of the cap to the stalk. This veil becomes stretched as a result of the growth of the cap and becomes thin ; at a given moment it ruptures (galipedes), exposing the hymenial gills. It may be absent or may rupture prematurely during the growth of the carpophore (mushrooms naturally exposed). This phenomenon is usually associated with partial or total sterility of the hymenium. *It may be brought on either by degeneration of the variety under cultivation or by cultural factors : excessive humidity or excessive cold, lack of aeration or badly fermented manure, and lastly, intense sunlight and likewise the attack of parasites such as Mycogone.*

In very much expanded individuals, part of this veil remains more or less attached to the stalk, forming around it a membranous ring which soon becomes dried up. Contrary to statements which still appear in some classical manuals, I can state emphatically that in the cultivated mushroom there is no volva or total veil enveloping completely the young carpophores as in the typical case of the Amanites.

The stalk, which is usually cylindrical, is more or less swollen at its base according to the different varieties under cultivation. It is made up of hyphae or mycelial threads lying in parallel and here and there crossed by threads interwoven with them.

The cap, which is more or less spherical and slightly flattened at its summit, presents a structure akin to that of the stalk ; that is to say, it is likewise made up of mycelial threads which are compacted together into a false tissue or *plectenchyma ;* the threads, which are usually arranged in bundles, become curved from the top of the stalk towards the hymenial gills which together form the *hymenium.* The hymenial gills, which are on the lower side of the cap, are free ; in other words, they are not attached to the stalk. Since the stalk is situated centrally they are arranged radially and extend from the point of insertion of stalk to cap as far as the edge of the cap. Shorter gills interposed between the larger ones and extending to a half or quarter of their length lie in the space between each pair of large gills.

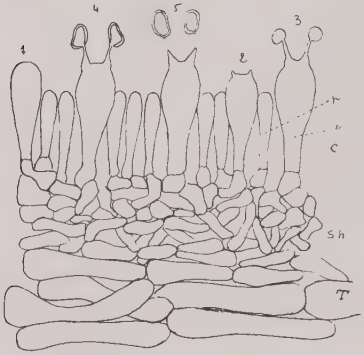


Fig. 7. Section through the hymenium showing the development of the basidium:
(1) Young basidium.
(2) The two sterigmata are forming.
(3) The spores are becoming swollen at the tip of the sterigmata.
(4) The spores increase in size.
(5) The spores have become abstricted.
(b) Basidium.
(p) Paraphysis.
(c) Hymenial layer.
(sh) Sub-hymenial layer.
(t) Centrally situated trama.

The hymenial gills are deserving of close study. Their function is important : it is thanks to this sporogenous tissue that the varieties of the cultivated mushroom have been perpetuated to this day, ensuring by the dissemination of the spores the perennial existence of the species. During the maturation of the carpophore the hymenial gills change from a pink shade to a brown shade and then to blackish brown. The colour is due to the pigment in the spores, which are produced in great numbers on the surface of the gills ; and later, in aged specimens, it is due to the blackening caused by the oxidation of the cell-walls of the spore-bearing parts which die after accomplishing their mission of reproduction.

In order to examine at a suitable magnification the anatomical details of the parts which constitute the hymenial gills it is necessary to cut a thin section at right angles to the edge of the gill with a very sharp razor. Under the low-power objective lens of the microscope this section looks like the finger of a glove. At the centre is a false tissue made up of roughly parallel hyphae, the ends of which turn outwards in the form of shorter cells in the sub-hymenial layer. These cells eventually give rise to a layer of neatly arranged structures which lie parallel to one another, namely, the basidia and paraphyses of the hymenial layer.

In the young carpophores certain cells which are larger than the basidia, namely the cystidia, are interspersed between the structures of the hymenium described above and exercise an excretory function which will be studied more particularly in the chapter on the cytology of the cultivated mushroom.

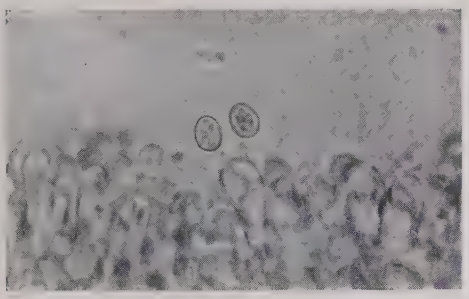


Fig. 8. Basidia bearing 2 spores, each of which is at the extremity of a sterigma. × 1,000.

The basidia are the fertile structures of the hymenium each giving rise to basidiospores or spores which usually are two in number and are born individually on a delicate stalk. This stalk is produced as a result of the progressive terminal elongation of the basidium. On the tip of the sterigma, which is a very narrow tube, is formed the spore which increases in size as it receives the flow of living substance expelled from the basidium, just as a soap-bubble becomes dilated with air at the tip of a blow-pipe (figs. 8 and 10).

Reference :—Kligman, A. M. Secondary spores in the mycelium of the cultivated mushroom *Psalliota campestris* Fr. Amer. J. Bot. 29, April, 1942.

FORTHCOMING MEETINGS

Saturday, 5th July, 1952 : The Kent/Surrey/East Sussex Group are planning to meet in East Sussex.

Tuesday, 15th July : Members and prospective members are invited by the Chairman to " walk round " Aylesbury Mushrooms Ltd., Ford, near Aylesbury, at 2 o'clock. Tea in Aylesbury at 4. Informal discussion from 5 to 6.

Other area meetings are being arranged. Details in due course.

The provisional date of the Annual General Meeting and Mushroom Lunch is Wednesday, 1st October. They may not be in London this year.

COSTS AND PROFITS

SIGNIFICANT ANALYSIS

by Dr. R. L. Edwards

Commercial mushroom growers are in business to make a profit.

It is fashionable nowadays to discuss the ethics of profit making, but I do not propose to do so. Instead I want to discuss the relation between cost and profit and the various factors which affect them.

Some of the points I wish to make may seem very elementary, but they are apt to be overlooked, and for the sake of clearness I think it is worth starting at the beginning.

The object is to make an annual profit, and usually to make it as large as possible.

Annual profit is the difference between receipts from sale of mushrooms and the cost of growing them **during the whole year,** with suitable provision for capital expenditure, depreciation etc. ; or expressed on a pound of mushrooms basis :—

Annual profit = total receipts—total costs
= (output × selling price per lb.)—(output × cost per lb.)
= output × (selling price—cost per lb.)

This shows the importance of annual output in determining profits, the other factor being, *not* cost per lb. as is often imagined, but the difference between selling price and cost per lb.

Receipts are determined by the output of mushrooms sold multiplied by the average selling price per lb. The selling price is out of the grower's control ; for budgetting purposes he must assume an average price, or a lower limit below which it is unlikely to fall. He has some degree of control over the output, which we will consider in more detail later.

The total annual cost is not as simple to deal with, and is not directly related to output of mushrooms. Clearly if output rises without any change in total annual cost, the cost per lb. falls ; and if the selling price is maintained, the profit per lb. and the annual profit both rise.

It is more likely that any substantial increase in output will involve some increase in total cost. To determine whether this change is still profitable one must know either the increase in total cost and the increase in receipts, or the selling price per lb., the old and new outputs, and the old and new production costs per lb.

Increase in profit = increase in receipts—increase in cost
= (New receipts—new cost)—(old receipts—old cost)
= New output × (selling price—new cost per lb.) —old output × (selling price—old cost per lb.)

The above is a brief statement of the principles which determine profit or loss, and their relation to cost, output, and selling price.

Now what can the grower do about it ?

He may be able to increase his output :

(*a*) by improving his compost, e.g. fortifying, peak heating, use of gypsum, better turning.

(*b*) by changing or improving his casing soil.

(*c*) by reducing losses through pests and disease, e.g. use of insecticides, better cleaning between crops and general sanitation.

(*d*) by improving general cultural methods, e.g. watering, ventilation.

(*e*) by better management, e.g. more economic cropping period, shorter idle period for cleaning houses.

In each of these cases he should consider whether the improvement will increase his annual cost and if so whether the expected higher output will cover the higher cost.

He may be able to reduce his costs :—

(*a*) by reducing labour, e.g. cutting out unnecessary work, mechanisation, improved methods of working.

(*b*) by reducing consumption of materials, e.g. making compost fill a greater area, using less fuel, spawn, casing soil, disinfectants and insecticides.

(*c*) by using cheaper materials, e.g. packing materials, casing soil, disinfectants and insecticides.

Before introducing any economy measures the grower should consider their probable effect on yield, and from that their effect on annual profit. In connection with any attempt to increase output or reduce cost he should also consider how much may be gained or saved. e.g. a grower using casing soil at 5/- per ton cannot save much on that.

It is also instructive to apportion costs in another way :—

(*a*) dependent on tonnage of compost
e.g. manure
gypsum
labour for turning.

(*b*) dependent on bed area
e.g. spawn
casing soil
labour for spawning, casing, watering, spraying.

(*c*) dependent on unit house
e.g. fuel
labour for dusting and cleaning between crops.

(*d*) dependent on output of mushrooms
e.g. labour for picking, packing, cleaning beds
packing materials, soil for filling in.

It is much easier to consider examples than such abstract statements and the following two are based on figures kindly supplied by mushroom growers.

It is not suggested that these figures are typical of any particular kind of farm or that either of them represents any kind of average. The average mushroom grower is probably as fictitious as the average woman with 0.8 husbands and 2.2 children.

They are merely two examples from mushroom farms which are not conspicuously different from other good farms, and they are given here to illustrate some of the points already mentioned.

Growers who are sufficiently interested will be able to compare their own costs for various jobs with those quoted, and to draw their own conclusions.

Costs per 1,000 sq. ft. for one crop

	Farm A	£ s. d.	Farm B	£ s. d.
Filling rate per ton of manure	55 sq. ft.		62 sq. ft.	
Average yield	2.5 lb./sq. ft.		1.7 lb./sq. ft.	
Manure	18 tons @ £4	72 0 0	16 tons @ £3	48 0 0
Labour, stacking, turning, filling	240 man hours	30 0 0	144 man hours	18 0 0
Spawn		6 0 0		10 0 0
Labour, spawning ..	16 man hours	2 0 0	8 man hours	1 0 0
Casing soil		10 10 0		2 5 0
Labour, casing ..	40 man hours	5 0 0	30 man hours	3 15 0
Labour, watering ..	24 man hours	3 0 0	6 man hours	15 0
Labour, picking and cleaning beds ..	160 man hours	20 0 0	56 man hours	7 0 0
Labour, packing ..	120 man hours	15 0 0	56 man hours	7 0 0
Packing materials ..		26 0 0		17 14 0
Labour, emptying and cleaning house ..	56 man hours	7 0 0	32 man hours	4 0 0
Fuel		4 0 0		10 0 0
Production labour (other than picking and packing) ..	376 man hours	47 0 0	220 man hours	27 10 0
Picking and packing labour	280 man hours	35 0 0	112 man hours	14 0 0
Non-productive labour (see below)	160 man hours	20 0 0	80 man hours	10 0 0
Total labour	816 man hours	102 0 0	412 man hours	51 10 0
Overhead charges (see below) ..		40 0 0		28 0 0
Total cost per 1,000 sq. ft. ..		260 10 0		167 9 0
Return if sold at 3s. per lb. 2,500 lb.		375 0 0	1,700 lb.	255 0 0
Profit		114 10 0		87 11 0
Total labour force, 1 man per ..		1,080 sq. ft.		2,140 sq. ft.
Output of mushrooms per man, per year		6,750 lb.		9,100 lb.

These figures may be presented in other ways ; the following are interesting and help to keep them in perspective.

On cost per square foot basis	s. d.	s. d.
Manure	1 $5\frac{1}{4}$	$11\frac{1}{2}$
Labour	2 $0\frac{1}{2}$	1 $10\frac{3}{8}$
Other costs	1 $8\frac{3}{4}$	$9\frac{1}{2}$
Total cost per sq. ft.	5 $2\frac{1}{2}$	3 $4\frac{1}{4}$
Yield per sq. ft.	2.5 lb.	1.7 lb.
Return at 3/- per lb.	7 6	5 $1\frac{1}{4}$
Gross profit per sq. ft.	2 $3\frac{1}{2}$	1 9

On cost per lb. of mushrooms basis		
Manure	$6\frac{7}{8}$	$6\frac{3}{4}$
Labour	$9\frac{7}{8}$	$7\frac{1}{4}$
Other costs	$8\frac{1}{2}$	$9\frac{5}{8}$
Total costs per lb.	2 $1\frac{1}{4}$	1 $11\frac{3}{8}$
Return per lb.	3 0	3 0
Gross profit per lb. of mushrooms	$10\frac{3}{4}$	1 $0\frac{3}{8}$

In addition to the various main operations of mushroom growing there are many others, not directly productive and each insignificant in itself, which none the less add up to an appreciable amount of labour. This must be included in the general costs and is shown above as non-productive labour.

Similarly, there must be provision for management, office expenses, depreciation and cost of repairs to buildings, machinery and growing equipment, all covered by overhead charges as shown above.

There are many points of interest in these costings. The 50% greater yield on Farm A far outweighs the 60% greater total cost per house unit, and in spite of its greater cost per (equal) house unit and per lb. of mushrooms, Farm A makes about 40% more profit.

If the price fell to 2/2d. per lb., Farm A would have a profit of £8 (£268.6.8—£260.10.0) ($\frac{3}{4}$d. per lb.) and Farm B £17 (£184.6.8—£167.9.0) ($2\frac{3}{8}$d. per lb.) leaving Farm B better off. Thus **a change in selling price, without any change in their cost or output, can reverse their positions with regard to profit.** They would come off about equally well at a selling price of 2s. 6d., above that Farm A is better off.

Now where can these farms reduce costs ? Manure and labour account for about 80% of the total and therefore offer most scope.

Farm A has relatively high labour costs in all departments, but this may be a sign that the work is being more thoroughly done, and it would be risky to start a " speeding-up " campaign without being sure that the quality of work would not suffer. Farm A's casing soil is expensive, but again that may contribute substantially to the higher yield. Mechanisation of compost turning might reduce these costs considerably and would pay if it did the job equally well.

Farm A's packing labour is high even allowing for greater output.

Farm B's only obvious chance of saving is in spawn, which is used rather liberally, but the extra cost is small.

Apart from A's packing labour and B's spawn, any reduction in costs should be sought by looking at each job on the farm, to see whether it can be more efficiently or economically done, rather than by looking at costings and deciding to prune them here or there. Costing figures show which items are big enough to afford a chance of cutting costs ; they should not be made the *sole* basis of any cuts which may affect output.

There may be indirect ways of reducing costs. Shallower beds reduce the cost per sq. ft. of manure and its preparation, but also usually reduce yields. More shelves in a house reduce fuel and some other costs per sq. ft. but there is a limit beyond which this too reduces yield.

Apart from these main costs, there may be opportunities of small savings by wise buying and good housekeeping, finding the cheapest materials which are satisfactory for each job and taking care of all equipment to reduce the cost of repairs and replacements. These things vary so much from one farm to another that they cannot usefully be discussed in detail here.

RESEARCH OPEN DAY AND FILM SHOW

For those unable to attend the Mushroom Industry Exhibition at Worthing in March, the Yaxley Research Station was open to visitors on Wednesday, 24th April. The exhibits were along the same lines as those staged at Worthing, but there was much more opportunity to discuss problems with the Director of Research and his staff.

In the evening about 150 members and friends were present at the Angel Hotel, Peterborough, to see two films. The first was the brilliant French film taken through a microscope of the various mechanisms by which fungi capture and devour eelworm. By the end of the second reel the non-technical sections of the audience were growing a little restive, despite a most helpful commentary by Dr. I. F. Storey, the N.A.A.S. mycologist from Cambridge, and it would perhaps have been better to omit the third and final reel of " Recherches experimentales sur les champignons predateurs des nematodes du sol."

It was a light and welcome relief to turn to the colour film, " Mushroom Growing," made by the film unit of Plant Protection Ltd., in association with W. Darlington & Sons and with the help of the M.G.A. and M.R.A. and a number of M.G.A. members. A useful commentary was given by Dr. R. L. Edwards.

By now, nearly all growers in Great Britain and Northern Ireland must have seen this exceptionally good film. The lighting and projection were much better than at the Worthing Exhibition, and the only criticism heard concerned the lack of continuity of processes shown in the middle of the film.

REFRESHER COURSE, 1952

A refresher course was held at the Angel Hotel, Peterborough, on Thursday, 24th April. As over 100 growers and N.A.A.S. officers had enrolled, a room larger than last year's had to be engaged, and the projector, the epidiascope and the voices of some speakers proved quite inadequate. In recording that changes will have to be made on any such future occasion, no discredit is intended to Dr. R. L. Edwards, Director of M.R.A. Research, who organised the function, and no one regretted having made the journey—not even the French and Danish visitors.

Dr. R. L. Edwards opened the morning session with a brief review of outstanding practical developments during the past year or two. He spoke in more detail of the control of parasitic diseases by selective fungicides. Two new ones had been found which could safely be used to control *Mycogone*, *Verticillium*, *Dactylium* and possibly Bacterial Diseases, at least under some conditions. These were Zinc ethylene bis dithiocarbamate (" Zinc bis "—or " Zineb," as one member of the audience urged us to call it) and Tetramethyl thiuram disulphide (TMTD). The old-established fungicide, copper sulphate, had also been used experimentally to control Truffle without injuring the mushroom, and he hoped to arrange trials on farms in co-operation with growers and the N.A.A.S. this summer. It was sprayed on the compost immediately prior to filling.

Mr. M. C. Luxmoore took as his subject " Buildings for Mushroom Growing " and he proved to be an accomplished and entertaining speaker. His main contention was that the house was the most important contributor to success in growing because, while its influence could be as great as that of compost, casing soil and management, once it was built it was much more difficult and costly to alter than any of those other features.

" The design of a house imposes a definite limit on the yields obtainable in it, however good the compost, soil and management may be," he said. " This may account for some of the disbelief in high yields often expressed by growers who never have them."

The special requirements in a mushroom house were adequate, controlled ventilation to all parts of it, controlled heating, insulation to exclude heat in summer and conserve it in winter, particularly for peak heating. A shelf house should be designed to give the best results during the cropping period, and any other special requirements such as peak heating should be obtained by methods which did not impair its cropping performance.

He preferred brick cavity walls carrying the roof and packed with fibreglass or rockwool, roofs insulated with a similar material, electric heating and a portable supplementary heat source for peak heating. Electric heating was labour-saving and ideal in performance and control ; its cost was shattering ! Another efficient method of heating was by low-pressure steam. Creosote was a good timber preservative, fungicide, and fly deterrent, but should not be used on unseasoned wood.

Dr. I. F. Storey outlined his investigations with Mr. Middlebrook into the comparative cropping capacities of Handcraft and American houses at Brayton. The former were better in winter, the latter in summer. The yield from Handcrafts was found to be nearly $\frac{1}{2}$ lb. per sq. ft. better than in Americans.

The first step taken to improve the yields of the American houses in winter was open the bottom ventilators. The effect of doing this was to increase the average yield and also the speed of cropping, despite the low air-to-bed ratio. The other problem was to improve the level of the summer cropping in the Handcrafts. No progress had been made as the weather during the past two summers had been cool and production almost normal. It was intended to instal fans in order to move the air whenever the outside temperature remained for long periods above the temperature inside the house. *He felt sure an adequate air movement was needed at all times, and believed it could to some extent overcome the effects of a low air-to-bed ratio.*

Mr. H. G. Boxall discussed " Mushroom Growing on a Glasshouse Holding " with the help of a number of photographs. Mushrooms were still grown as a catch crop under glass in very much the same way

as they were 25 years ago, he said. Glass was shaded with clay for the autumn crop. Watering was done by can. Manure was turned three to five times, at intervals of two or three days, and then laid in floor beds which usually heated up. Later this heating was recognised as beneficial and was artificially assisted. Rotation was practised to allow a mushroom crop in each house once in three years.

On his nursery at the end of the War large " dark houses " holding 10,000 sq. ft. of bed were built which were now to be sub-divided into two houses of 5,000 sq. ft. each. Turning was mechanised by using a Ferguson tractor with fork lift feeding a modified Salopian muck spreader which threw the manure into the new pile between guiding baffles. The same tractor carried the finished compost into the house and lifted it to the upper floor, and also carried in the soil for casing. Local brick earth was used for casing, the top two spits being discarded. A machine broke up the soil and mixed it with granulated peat (10%) and lime. The beds were cased 21 days after spawning. The spent compost was used on bulbs, carnations, tomatoes and wheat grown on the same holding.

His idea of an ideal production unit was a building 160 ft. × 20 ft. divided to make a heat room between two cropping rooms each holding 3,000 sq. ft. of trays; with an 11-week cycle this unit would give 27,000 sq. ft. of crop a year. An 80 ft. gravity conveyor would provide for all necessary tray movement.

Mr. P. B. Flegg dealt with " Some Properties of Casing Soils and their Management." The optimum pH range was 7·0—8·5. Even if the soil were within this range an addition of calcium might be beneficial. Too high an initial pH might result from the use of hydrated lime, though this could be overcome by storing treated soil before use. With calcium carbonate there was no danger of a high pH, and it was just as good as hydrated lime. Dolomitic or magnesium limestone should be avoided, as it might reduce the yield.

Discussing water-holding properties, he said (a) there was a degree of dryness at and beyond which fruiting did not occur ; (b) it was the amount of *available* water present in the soil which was important ; (c) a soil (such as clay and organic soils) which would hold a larger quantity of available water was preferable to a soil which would hold little (such as sandy soil) ; (d) Peat, pre-wetted and with adjustment of its pH, was suitable for increasing the water-holding properties of a soil, up to 50% having been used successfully in practice and 100% successfully on pots.

The danger of preventing a sufficient interchange of gases between the compost and the air could be avoided by (1) using a fairly lumpy soil ; (2) adding peat where most of the soil was fine ; and (3) not firming the casing soil.

The structure and stability of the soil was important. Panning of the soil preventing aeration of the bed was serious, and the danger was greatest before the first picking. It could be overcome in some soils by adding peat or adjusting the frequency and amount of watering.

The addition of ashes might also tend to keep a soil " open."

Dr. Edwards closed the Course with a few words on " Experiments on Farms." To be worthwhile, experiments on farms must satisfy the following conditions : They must measure the difference, if any, due to the experimental treatment ; they must give an estimate of the reliability of that difference ; and the result must be useful or must be a step towards a useful result.

The first two requirements depended on the design of the experiment, which was a job for a specialist. One essential was that each treatment must be repeated several times. *It was unlikely that farm experiments could detect a difference in yield of* 10% *or less.* Experiments could not prove that there was no difference in yield between two treatments.

Many experimental treatments depended for their effect on local conditions—of houses, compost, casing soil, management and season. This might have to be considered on a particular farm and certainly could not be overlooked when comparing results between farms.

Experiments on disease were often worthwhile and, if successful, effects were often striking. Casing soil experiments also were likely to give useful effects. Both of these could be laid out on the same bed of compost, thus reducing one source of error.

Mr. Stanley Middlebrook presented an important paper on " Short Composting." Our report is held over until the July issue because space in this will not permit the inclusion of any of his graphs.

The Chairman at the morning session was **Mr. Fred. C. Atkins,** and at the afternoon session **Mr. John Stewart-Wood,** M.G.A./M.R.A. Chairman.

NEW M.G.A. MEMBERS

Albrecht, C., Barnhouse Farm, Shipley, Horsham, Sussex. (Tel. Coolham 200.)
Carew-Shaw, Dr. E., Courtlands, Shipley Bridge, Horley, Surrey. (Tel. Horley 407.)
Green, Jacob M., R.D. 4, Coatesville, Pennsylvania, U.S.A.
Gregory, L., 2 Westwood Park, London, S.E. 23.
Hullen, Erich, Champignon-Kulturen, Erlangen, Germany.
Jacobsen, T., Slangerup, Denmark.
Kjeldsen, J. M., Viralan Kartanon, Turenki, Finland.
McCheane, R. L., P.O. Box 606, Hamilton, N. Zealand.
McCord, D., c/o Australian & New Zealand Bank Ltd., 6 Albermarle St., W.1.
O'Rourke, W. B., 138 Howth Road, Clontarf, Dublin.
Ruebens, T. G., 5 Rose Terrace, Perth, Scotland.
Sala, J. Z., The Mushroom Barn, Broadbridge Heath, Horsham, Sussex. (Tel. Broadbridge Heath 149.)
Soames, Miss C. W., 30 Loudoun Road, London, N.W.8.
Stacey, G. J., c/o Blandford Farm Products, Upper Shaftesbury Road, Blandford, Dorset.
Stoller, Dr. B., 414 North 18th Avenue East, Duluth 5, Minnesota, U.S.A.

CHANGES OF ADDRESS OR STATUS

Bels, Dr. P. J., c/o Messrs. Slack Brothers, Waterloo, Quebec, Canada.
Dingwall, I. G. P., Ministry of Agriculture Horticultural Centre, Loughgall, Co. Armaugh.
Dunbar, W., c/o The Bungalow, Pilsdon Manor, Bridport, Dorset.
Simons, R., Mayes Cottage, Tye Green, Netteswell, Harlow, Essex. (Tel. Potter Street 65.)

Italics indicate honorary membership.

SPECIAL HEATING NUMBER

We propose to publish a special Heating number on 1st August. Manufacturers and suppliers of heating plant and equipment, insulating material, thermometers, etc., are invited to take advantage of this exceptional opportunity to bring their goods to the notice of the Mushroom Industry.

Correspondence

May we congratulate all concerned on the excellence of the Worthing **Show**, the high standard of which cannot but help emphasise that the M.G.A. is ensuring the Mushroom Industry being provided with a scientific and technical service of extremely high quality.

C. MINIFIE, Manager, Cawdor Industries Ltd.

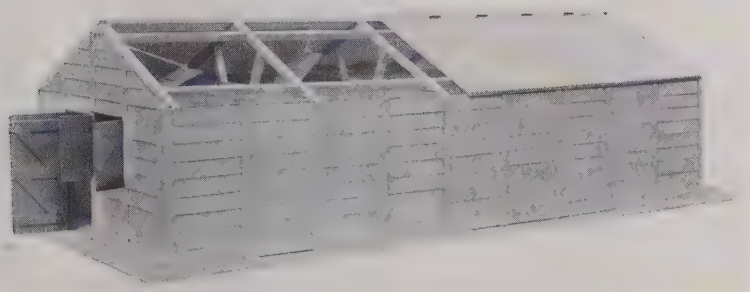
I consider my **subscription well spent.** I have already realised what a hazardous and difficult operation mushroom culture can be. I shall not be tempted to commence with insufficient capital, unaware of the difficulties involved. It is fortunate for the ignorant and inexperienced that your organisation exists. **Dr. H. W. TOPHAM.**

Dr. Sinden has said that the production per inch thickness of bed is linear up to five inches and then tails off. Five inches thickness is, therefore, the theoretical ideal. By the traditional method of composting, one ton of manure will give 112 sq. ft. of five-inch bed. If the **Sinden Method** of composting is employed, and gives 200 sq. ft., there is a saving of 88 sq. ft. My experience and that of another grower is that the Sinden Method gives 180 sq. ft. per ton of manure, but be that as it may, there is a saving on each ton somewhere between 88 and 68 sq. ft. Let us accept the lower figure. If we take the case of a grower using 200 tons of manure a year and assume that the cost of his manure (with turning, gypsum and overheads) works out at £5 a ton, then the annual saving will be 66 tons or £330. Now assuming that the Sinden Method lasts 12 days and the traditional method averages 32, then the saving of £330 takes place over a period of 32 less 12 equals 20 days. Therefore every day that the composting period is lessened represents an annual saving of £330 over 20 = £11 to £12. **Lt. Col. E. NOEL.**

In an open all-the-year-round climate as possessed by **Tasmania,** stable manure is conspicuous by its complete absence, and another weak point is the supply of containers, chip baskets being practically unknown. There is however a splendid air service to mainland markets, and the freightage rates appear reasonable ; for example, the rate to Melbourne is 2½d. lb. for 100 lb. and over, below this figure 6d. lb. I think, knowing the erratic behaviour of mushrooms during fruition, it would be good business to combine their production with other high-class and more consistently cropping lines in order to keep the freight rates down to the minimum figure. The majority of Australian mushroom growers are, I understand, in the vicinity of Sydney and here I believe it is engaged in as an adjunct to poultry farming, using the fowl manure for composts. Before leaving England I attempted this form of production using a 6 : 1 ratio of manure to straw. The crop was up to our usual average for horse-manure on 6″ deep beds, finishing up at 1.98 lb. sq. ft. The only drawback as far as I could see, and it's the usual complaint here, was the smallness of the mushrooms which made picking and trimming tedious. However, I suppose these difficulties will in time be overcome. In conclusion, may I wish the M.G.A. every success ? **N. FELL.**

June 26th, 27th and 28th. The N.F.U. Market Produce Show Society's BRITAIN CAN GROW IT Show at Reading. M.G.A. Sec. Angus Watson will be present to discuss Grading with Mushroom Growers.

MUSHROOM HOUSES



2—The Darstone House :: *by C. Minifie*

It may appear to be a long journey to travel from the stone face of a limestone quarry to the mushrooms on the dining table, but a very considerable connection exists through the medium of insulation and provision of cropping house design offered by Cawdor Industries Ltd., a subsiduary company of Derbyshire Stone Ltd., Matlock, who own and operate widely spread limestone quarries.

The application of scientific knowledge that has been given to the development of the Mushroom Industry shows in the wide and sound conditions prevailing, and perhaps no greater thought has been given to any particular side of equipment and material than to the design of a house suitable for scientific production and which embodies the very stringent requirements of modern growing practice.

For some time past Cawdor Industries Ltd. have been concerned with research into the essential features of cropping house structure and are now offering these results in the form of a prefabricated concrete cropping house in which particular attention is given to insulation and heat control.

This new unit is styled the " Darstone House " and is completely prefabricated and so designed that it can be erected with entirely unskilled labour.

The outer walls are built up with specially shaped weathered panels that slide into rebatted pillars which are also rebatted on the inside to accommodate the inner lining.

This inner lining is built up of asbestos sheeting and the main structural pillars are so designed to offer a complete cavity on both the side and gable walls between the outer and inner panelling, allowing approximately three inches thickness of packed Cawdorite rock wool insulation right up to the eaves.

It will be seen that this type of structure offers a firm and solid building, easy to erect, and gives the maximum protection against heat loss or filtration from ground level to eaves.

The roof is constructed of specially designed tubular trusses, and underslung is a false ceiling securely fastened to the main ties and cross-ties embodied within the tubular construction.

The false ceiling is fitted with special ventilation control, the vent covers being actuated from the outside of the building. Loose Cawdorite rock wool approximately three inches thick is laid on the top surface of the ceiling and thereby provides a completely insulated unit.

Down draft ventilation ducts are provided on the gable walls.

The whole structure finally equipped with doors and windows to suit growers' particular requirements can be utilised to fit any site and is provided as a single complete unit or may be built into terrace houses with normal partition walls.

With the design of the Darstone House taking care of the physical necessities of the mushroom grower, Cawdor Industries Ltd. offer a consultant service that does everything possible to relieve the grower of many of the burdens and anxieties of planning and erection of new property, from the initial planning stages through to the final erection.

RESEARCH APPEAL, 1952

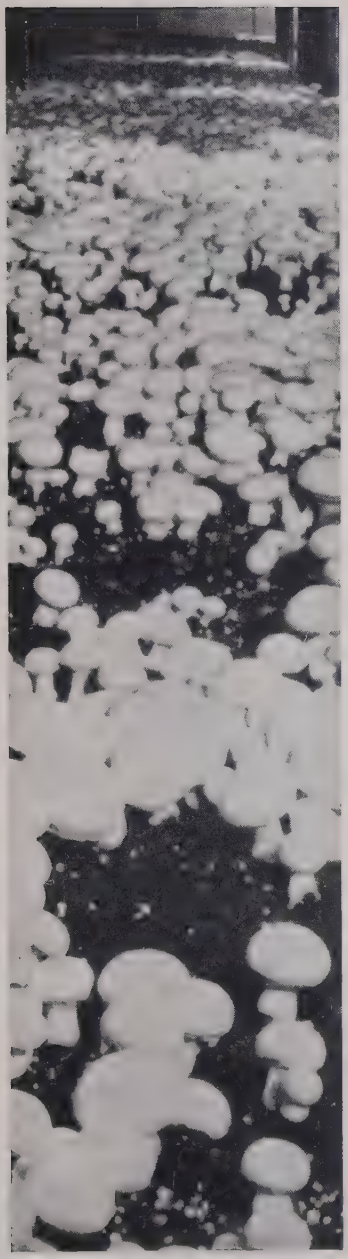
Contributions to the Research Fund received from the 2nd April to 5th May inclusive were as follows: D. B. Gill £10; Campbell Melville £10; Brig. H. S. J. Bourke £2 10s.; H. C. Parsons £2; D. McCord £1 1s.; Total £25 11s. Banker's Orders totalled £40 10s., bringing the Fund up to £942 14s. 8d. The Target is £1,500.

FRENCH MUSHROOMS FOR BRITAIN

Monsieur P. Guiochon, President of the French Mushroom Growers' Federation, reports in their Bulletin 19 that in 1951 France exported **81 tons** of fresh mushrooms to Britain, compared with 69·5 tons in 1950 and 204.4 tons in 1949. Total exports of fresh mushrooms were 310·5 tons in 1951, against 359·9 tons in 1950. Exports of canned mushrooms rose from 3,731 tons in 1950 to 4,269 tons in 1951; of these about **128 tons** came to Britain. The largest sales were to French colonies, but substantial amounts went to the United States, Canada, Australia, Malaya and Hong Kong.

Monsieur P. Lombrage, of 12 Boulevard du Roy-Rene, Aix-en-Provence, France, writes to say he will be pleased to see any English growers who may be in his neighbourhood during the holiday season.

Boxes for Sale: 700 strong boxes suitable for mushroom growing. Size 26″ × 17″ × 6″ standing on legs to enable the mushrooms to get plenty of air. Prepared to sell in small quantities or as a whole. Mrs. A. F. Newstead, 36 Augustus Road, Edgbaston, Birmingham. '*Phone:* EDG. 2009.



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THE THREE MAIN GRADES

There is still some confusion among growers over what is and what is not an Open in the Ministry of Agriculture's recommended grades. At the suggestion of the Chairman of our Grading Committee, therefore, here are photographs of a Button (cap diameter 1″ to 2½″; maximum stem length ¾″), a Cup (cap 1″ to 2½″, stem 1″) and an Open (cap 1″ to 2½″, stem 1″) :

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• MURTHANE WETTABLE

Use 1 lb. per 100 gallons, applied at 1 gallon per 100 sq. ft. of bed.

1 cwt.	£97 10 0
56 lbs.	£50 0 0
28 lbs.	£26 0 0
14 lbs.	£13 10 0
7 lbs.	£7 0 0

Wet spraying costs approximately 2/- per 1,000 sq. ft.

• MURTHANE DUST 15%

Give three applications at 8-12 oz. per 1,000 sq. ft. of bed or apply weekly at 4 oz.

1 cwt. @ 4/6 lb.	£25 4 0
56 lbs. @ 4/9 lb.	£13 6 0
28 lbs. @ 5/0 lb.	£7 0 0
14 lbs. @ 5/3 lb.	£3 13 6
7 lbs. @ 5/6 lb.	£1 18 6

Dusting costs approximately 1/1 per 1,000 sq. ft.

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Manure for mushroom culture such as that from racing stables is frequently in too long and dry a condition. This can be considerably improved by using ADCO "M" with better crops as a result.

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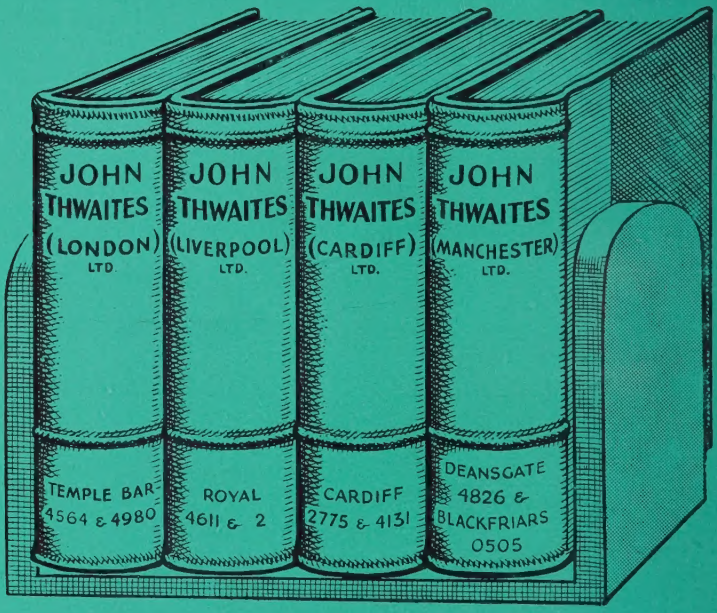
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